CETIFICATION

SDG No:	MC46948	Laboratory:	Accutest, Massachusetts
Site:	BMSMC, Phase 2A Release Assessment, Humacao, PR Humacao, PR	Matrix:	Groundwater

SUMMARY: Groundwater samples (Table 1) were collected on the BMSMC facility – Phase 2A Release Assessment Area. The BMSMC facility is located in Humacao, PR. Samples were taken July 17-20, 2016 and were analyzed in Accutest Laboratory of Marlborough, Massachusetts that reported the data under SDG No.: MC46948. Results were validated using the following quality control criteria of the methods employed (MAPED EPH, Massachusets Department of Environmental Protection, 2004) and the latest validation guidelines (July, 2015) of the EPA Hazardous Waste Support Section. The analyses performed are shown in Table 1. Individual data review worksheets are enclosed for each target analyte group. The data sample organic data samples summary form shows for analytes results that were qualified.

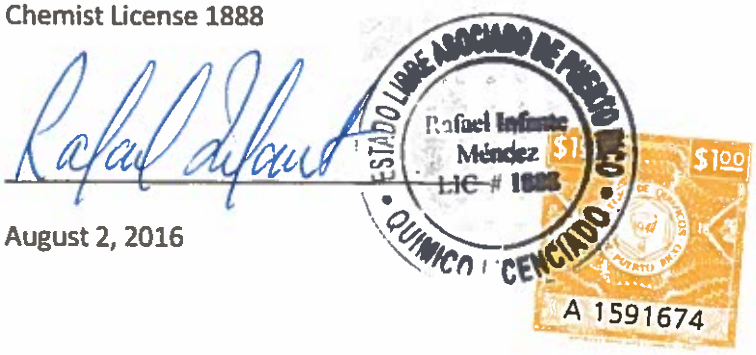
In summary the results are valid and can be used for decision taking purposes.

Table 1. Samples analyzed and analysis performed

SAMPLE ID	SAMPLE DESCRIPTION	MATRIX	ANALYSIS PERFORMED
MC46948-1	OSGP11-GWD	Groundwater	Extractable TPHC Ranges
MC46948-2	OSGP11D-GWD	Groundwater	Extractable TPHC Ranges
MC46948-3	OSGP11-GWS	Groundwater	Extractable TPHC Ranges

Reviewer Name: Rafael Infante
Chemist License 1888

Signature:



Date: August 2, 2016

SGS Accutest

Report of Analysis

Client Sample ID:	OSGP11-GWD		
Lab Sample ID:	MC46948-3	**Date Sampled:**	07/20/16
Matrix:	AQ - Ground Water	**Date Received:**	07/21/16
Method:	MADEP EPH REV 1.1 SW846 3510C	**Percent Solids:**	n/a
Project:	BMSMC Phase 2A Release Assessment, Humacao, PR		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14946.D	1	07/25/16	TA	07/21/16	OP48223	GDE832
Run #2							

	Initial Volume	Final Volume
Run #1	870 ml	2.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	5.7	1.8	ug/l	
208-96-8	Acenaphthylene	ND	5.7	0.41	ug/l	
120-12-7	Anthracene	ND	5.7	0.67	ug/l	
56-55-3	Benzo(a)anthracene	ND	5.7	0.35	ug/l	
50-32-8	Benzo(a)pyrene	ND	5.7	0.34	ug/l	
205-99-2	Benzo(b)fluoranthene	ND	5.7	0.51	ug/l	
191-24-2	Benzo(g,h,i)perylene	ND	5.7	0.43	ug/l	
207-08-9	Benzo(k)fluoranthene	ND	5.7	0.41	ug/l	
218-01-9	Chrysene	ND	5.7	0.50	ug/l	
53-70-3	Dibenz(a,h)anthracene	ND	5.7	0.45	ug/l	
206-44-0	Fluoranthene	ND	5.7	0.38	ug/l	
86-73-7	Fluorene	ND	5.7	0.46	ug/l	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	5.7	0.34	ug/l	
91-57-6	2-Methylnaphthalene	ND	5.7	0.52	ug/l	
91-20-3	Naphthalene	ND	5.7	1.1	ug/l	
85-01-8	Phenanthrene	ND	5.7	0.35	ug/l	
129-00-0	Pyrene	ND	5.7	0.69	ug/l	
	C11-C22 Aromatics (Unadj.)	33.6	110	33	ug/l	JB
	C9-C18 Aliphatics	25.2	110	19	ug/l	JB
	C19-C36 Aliphatics	58.5	110	31	ug/l	J
	C11-C22 Aromatics	33.6	110	33	ug/l	JB

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	54%		40-140%
321-60-8	2-Fluorobiphenyl	64%		40-140%
3386-33-2	1-Chlorooctadecane	50%		40-140%
580-13-2	2-Bromonaphthalene	69%		40-140%

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ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

ACCUTEST LABORATORIES

CHAIN OF CUSTODY

PAGE 1 OF 1

NE

30 D'Angelo Drive, Building One, Marlborough, MA 01752
TEL. 508-481-6200 FAX. 508-481-7753
www.accutest.com

809960562847 — Accutest Quote #

MC46948 — Accutest Job #

Get from NJ

Client / Reporting Information

Company Name: Anderson MulHolland & Associates
Street Address: 2700 Westchester Avenue, Suite 417
City: Purchase — State: NY — Zip: 10577
Project Contact: Terry Taylor — E-mail:
Phone #: 914-251-0400 — Fax #:
Sampler(s) Name(s): N. Rivers, R. Stuart, R. O'Reilly, T. Taylor — Phone #:

Project Information

Project Name: BMSMC Phase 2A Release Assessment
Street:
City: Humacao — State: PR
Project #: 821
Client Purchase Order #:
Project Manager: Terry Taylor

Billing Information (if different from Report to)
Company Name:
Street Address:
City — State — Zip
Attention:

Requested Analysis (see TEST CODE sheet)

BMA 7-20-16

Accutest Sample #	Field ID / Point of Collection	MEOH Vial #	Collection Date	Collection Time	Sampled by	Matrix	# of bottles	Number of preserved Bottles: HCl	MeOH	HNO3	H2SO4	NaOH	Zn Acet	NaHSO4	DI Water	C11-C22 Aromatics via MADEP EPH R	BMA EPH	LAB USE ONLY
-1	OSGP II - GWS		7-19-16	1305	TT	GW	3	2								X	XX	
-2	OSGP IID - GWS		7-19-16	1330	TT	GW	3	2								X	XX	
-3	OSGP II - GWD		7-20-16	1115	TT	GW	3	2								X	XX	
	~~OSGP~~ BK					GW	6	4								X	BK 7-20-16	
																		16C
						SB												

Matrix Codes: DW - Drinking Water; GW - Ground Water; WW - Water; SW - Surface Water; SO - Soil; SL - Sludge; SED-Sediment; OI - Oil; LIQ - Other Liquid; AIR - Air; SOL - Other Solid; WP - Wipe; FB-Field Blank; EB-Equipment Blank; RB- Rinse Blank; TB-Trip Blank

Turnaround Time (Business days)

- ☐ Std. 15 Business Days
- ☐ Std. 10 Business Days (by Contract only)
- ☐ 10 Day RUSH
- ☐ 6 Day RUSH
- ☒ 3 Day EMERGENCY
- ☐ 2 Day EMERGENCY
- ☐ 1 Day EMERGENCY

Emergency & Rush TAT not available VIA Lablink

Approved By (Accutest PM) / Date:

RUSH!

Data Deliverable Information

- ☐ Commercial "A" (Level 1)
- ☐ Commercial "B" (Level 2)
- ☒ FULLT (Level 3+4)
- ☐ NJ Reduced
- ☐ Commercial "C"
- ☐ NYASP Category A
- ☐ NYASP Category B
- ☐ State Forms
- ☐ EDD Format
- ☐ Other

Commercial "A" = Results Only
Commercial "B" = Results + QC Summary
NJ Reduced = Results + QC Summary + Partial Raw data

Comments / Special Instructions

INITIAL ASSESSMENT
LABEL VERIFICATION

Sample Custody must be documented below each time samples change possession, including courier delivery.

	Relinquished by Sampler:	Date Time:	Received By:	Relinquished By:	Date Time:	Received By:
1		7-20-16 1700	1 Fed EX	2 FEDO	7-21-16 930	2
3			3	4		4
5			6	Custody Seal # 206,748 7-20-16 — ☐ Intact ☐ Not Intact	Preserved where applicable ☐	On Ice ☒ Cooler Temp 5.3C

5.1

5

SGS Accutest

Report of Analysis

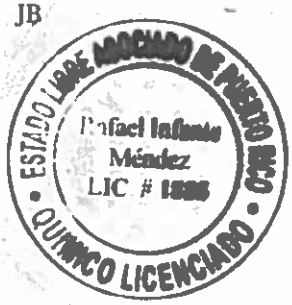
Client Sample ID:	OSGP11-GWS		
Lab Sample ID:	MC46948-1	**Date Sampled:**	07/19/16
Matrix:	AQ - Ground Water	**Date Received:**	07/21/16
Method:	MADEP EPH REV 1.1 SW846 3510C	**Percent Solids:**	n/a
Project:	BMSMC Phase 2A Release Assessment, Humacao, PR		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14944.D	1	07/25/16	TA	07/21/16	OP48223	GDE832
Run #2 [a]	DE14962.D	1	07/26/16	TA	07/21/16	OP48223	GDE833

	Initial Volume	Final Volume
Run #1	890 ml	2.0 ml
Run #2	890 ml	2.0 ml

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	5.6	1.8	ug/l	
208-96-8	Acenaphthylene	ND	5.6	0.40	ug/l	
120-12-7	Anthracene	ND	5.6	0.65	ug/l	
56-55-3	Benzo(a)anthracene	0.45	5.6	0.34	ug/l	JB
50-32-8	Benzo(a)pyrene	ND	5.6	0.33	ug/l	
205-99-2	Benzo(b)fluoranthene	ND	5.6	0.50	ug/l	
191-24-2	Benzo(g,h,i)perylene	ND	5.6	0.42	ug/l	
207-08-9	Benzo(k)fluoranthene	ND	5.6	0.40	ug/l	
218-01-9	Chrysene	ND	5.6	0.49	ug/l	
53-70-3	Dibenz(a,h)anthracene	ND	5.6	0.44	ug/l	
206-44-0	Fluoranthene	ND	5.6	0.38	ug/l	
86-73-7	Fluorene	ND	5.6	0.45	ug/l	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	5.6	0.33	ug/l	
91-57-6	2-Methylnaphthalene	ND	5.6	0.51	ug/l	
91-20-3	Naphthalene	ND	5.6	1.1	ug/l	
85-01-8	Phenanthrene	ND	5.6	0.34	ug/l	
129-00-0	Pyrene	ND	5.6	0.67	ug/l	
	C11-C22 Aromatics (Unadj.)	40.5	110	32	ug/l	JB
	C9-C18 Aliphatics	19.7	110	19	ug/l	JB
	C19-C36 Aliphatics	36.5	110	30	ug/l	J
	C11-C22 Aromatics	38.2	110	32	ug/l	JB

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	65%	57%	40-140%
321-60-8	2-Fluorobiphenyl	79%	62%	40-140%
3386-33-2	1-Chlorooctadecane	35% [b]	36% [b]	40-140%
580-13-2	2-Bromonaphthalene	85%	70%	40-140%



(a) Confirmation run.
(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

SGS Accutest

Report of Analysis

Client Sample ID:	OSGP11D-GWS		
Lab Sample ID:	MC46948-2	**Date Sampled:**	07/19/16
Matrix:	AQ - Ground Water	**Date Received:**	07/21/16
Method:	MADEP EPH REV 1.1 SW846 3510C	**Percent Solids:**	n/a
Project:	BMSMC Phase 2A Release Assessment, Humacao, PR		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE14945.D	1	07/25/16	TA	07/21/16	OP48223	GDE832
Run #2							

	Initial Volume	Final Volume
Run #1	880 ml	2.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
83-32-9	Acenaphthene	ND	5.7	1.8	ug/l	
208-96-8	Acenaphthylene	ND	5.7	0.40	ug/l	
120-12-7	Anthracene	ND	5.7	0.66	ug/l	
56-55-3	Benzo(a)anthracene	ND	5.7	0.34	ug/l	
50-32-8	Benzo(a)pyrene	ND	5.7	0.33	ug/l	
205-99-2	Benzo(b)fluoranthene	ND	5.7	0.51	ug/l	
191-24-2	Benzo(g,h,i)perylene	ND	5.7	0.42	ug/l	
207-08-9	Benzo(k)fluoranthene	ND	5.7	0.40	ug/l	
218-01-9	Chrysene	ND	5.7	0.49	ug/l	
53-70-3	Dibenz(a,h)anthracene	ND	5.7	0.44	ug/l	
206-44-0	Fluoranthene	ND	5.7	0.38	ug/l	
86-73-7	Fluorene	ND	5.7	0.45	ug/l	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	5.7	0.33	ug/l	
91-57-6	2-Methylnaphthalene	ND	5.7	0.51	ug/l	
91-20-3	Naphthalene	ND	5.7	1.1	ug/l	
85-01-8	Phenanthrene	ND	5.7	0.35	ug/l	
129-00-0	Pyrene	ND	5.7	0.68	ug/l	
	C11-C22 Aromatics (Unadj.)	33.7	110	33	ug/l	JB
	C9-C18 Aliphatics	24.0	110	19	ug/l	JB
	C19-C36 Aliphatics	33.6	110	31	ug/l	J
	C11-C22 Aromatics	33.7	110	33	ug/l	JB

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	61%		40-140%
321-60-8	2-Fluorobiphenyl	69%		40-140%
3386-33-2	1-Chlorooctadecane	52%		40-140%
580-13-2	2-Bromonaphthalene	75%		40-140%

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LIC # 1888
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ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

EXECUTIVE NARRATIVE

SDG No:	**MC46948**	Laboratory:	**Accutest, Massachusetts**
Analysis:	**MADEP EPH**	Number of Samples:	**3**
Location:	BMSMC, Phase 2A Release Assessment Area Humacao, PR		

SUMMARY: Three (3) samples were analyzed for Volatiles TPHC Ranges by method MADEP EPH. Samples were validated following the METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: **None**
Major: **None**
Minor: **None**

Critical findings: **None**
Major findings: **None**
Minor findings:

1. Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB, no further qualification required.

2. Surrogate standard (1-chlorooctadecane) recovered outside control limit in sample MC46948-1. Outside control limits due to matrix interference. Confirmed by refractionation/reanalysis. No action taken.

COMMENTS: Results are valid and can be used for decision making purposes.

Reviewers Name: Rafael Infante
Chemist License 1888

Signature: Rafael Infante

Date: August 2, 2016

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC46948-1
Sample location: BMSMC Phase 2A Release Assessment, Humacao, PR
Sampling date: 7/19/2016
Matrix: Groundwater

METHOD: 8270D

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Acenaphthene	5.6	ug/l	1	-	U	Yes
Acenaphthylene	5.6	ug/l	1	-	U	Yes
Anthracene	5.6	ug/l	1	-	U	Yes
Atrazine	5.6	ug/l	1	-	U	Yes
Benzo(a)anthracene	0.45	ug/l	1	JB	JB	Yes
Benzo(a)pyrene	5.6	ug/l	1	-	U	Yes
Benzo(b)fluoranthene	5.6	ug/l	1	-	U	Yes
Benzo(g,h,i)perylene	5.6	ug/l	1	-	U	Yes
Benzo(k)fluoranthene	5.6	ug/l	1	-	U	Yes
Chrysene	5.6	ug/l	1	-	U	Yes
Dibenzo(a,h)anthracene	5.6	ug/l	1	-	U	Yes
Fluoranthene	5.6	ug/l	1	-	U	Yes
Fluorene	5.6	ug/l	1	-	U	Yes
Indeno(1,2,3-cd)pyrene	5.6	ug/l	1	-	U	Yes
2-Methylnaphthalene	5.6	ug/l	1	-	U	Yes
Naphthalene	5.6	ug/l	1	-	U	Yes
Phenanthrene	5.6	ug/l	1	-	U	Yes
Pyrene	5.6	ug/l	1	-	U	Yes
C11-C22 Aromatics (Unadj.)	40.5	ug/l	1	JB	JB	Yes
C9-C18 Aliphatics	19.7	ug/l	1	JB	JB	Yes
C19-C36 Aliphatics	36.5	ug/l	1	J	J	Yes
C11-C22 Aromatics (Unadj.)	38.2	ug/l	1	JB	JB	Yes

Sample ID: MC46948-2
Sample location: BMSMC Phase 2A Release Assessment, Humacao, PR
Sampling date: 7/19/2016
Matrix: Groundwater

METHOD: 8270D

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Acenaphthene	5.7	ug/l	1	-	U	Yes
Acenaphthylene	5.7	ug/l	1	-	U	Yes
Anthracene	5.7	ug/l	1	-	U	Yes
Atrazine	5.7	ug/l	1	-	U	Yes
Benzo(a)anthracene	5.7	ug/l	1	-	U	Yes
Benzo(a)pyrene	5.7	ug/l	1	-	U	Yes
Benzo(b)fluoranthene	5.7	ug/l	1	-	U	Yes
Benzo(g,h,i)perylene	5.7	ug/l	1	-	U	Yes
Benzo(k)fluoranthene	5.7	ug/l	1	-	U	Yes
Chrysene	5.7	ug/l	1	-	U	Yes
Dibenzo(a,h)anthracene	5.7	ug/l	1	-	U	Yes
Fluoranthene	5.7	ug/l	1	-	U	Yes
Fluorene	5.7	ug/l	1	-	U	Yes
Indeno(1,2,3-cd)pyrene	5.7	ug/l	1	-	U	Yes
2-Methylnaphthalene	5.7	ug/l	1	-	U	Yes
Naphthalene	5.7	ug/l	1	-	U	Yes
Phenanthrene	5.7	ug/l	1	-	U	Yes
Pyrene	5.7	ug/l	1	-	U	Yes
C11-C22 Aromatics (Unadj.)	33.7	ug/l	1	JB	JB	Yes
C9-C18 Aliphatics	24.0	ug/l	1	JB	JB	Yes
C19-C36 Aliphatics	33.6	ug/l	1	J	J	Yes
C11-C22 Aromatics (Unadj.)	33.7	ug/l	1	JB	JB	Yes

Sample ID: MC46948-3
Sample location: BMSMC Phase 2A Release Assessment, Humacao, PR
Sampling date: 7/20/2016
Matrix: Groundwater

METHOD: 8270D

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Acenaphthene	5.7	ug/l	1	-	U	Yes
Acenaphthylene	5.7	ug/l	1	-	U	Yes
Anthracene	5.7	ug/l	1	-	U	Yes
Atrazine	5.7	ug/l	1	-	U	Yes
Benzo(a)anthracene	5.7	ug/l	1	-	U	Yes
Benzo(a)pyrene	5.7	ug/l	1	-	U	Yes
Benzo(b)fluoranthene	5.7	ug/l	1	-	U	Yes
Benzo(g,h,i)perylene	5.7	ug/l	1	-	U	Yes
Benzo(k)fluoranthene	5.7	ug/l	1	-	U	Yes
Chrysene	5.7	ug/l	1	-	U	Yes
Dibenzo(a,h)anthracene	5.7	ug/l	1	-	U	Yes
Fluoranthene	5.7	ug/l	1	-	U	Yes
Fluorene	5.7	ug/l	1	-	U	Yes
Indeno(1,2,3-cd)pyrene	5.7	ug/l	1	-	U	Yes
2-Methylnaphthalene	5.7	ug/l	1	-	U	Yes
Naphthalene	5.7	ug/l	1	-	U	Yes
Phenanthrene	5.7	ug/l	1	-	U	Yes
Pyrene	5.7	ug/l	1	-	U	Yes
C11-C22 Aromatics (Unadj.)	33.6	ug/l	1	JB	JB	Yes
C9-C18 Aliphatics	25.2	ug/l	1	JB	JB	Yes
C19-C36 Aliphatics	58.5	ug/l	1	J	J	Yes
C11-C22 Aromatics (Unadj.)	33.6	ug/l	1	JB	JB	Yes

DATA REVIEW WORKSHEETS

Type of validation Full:__X____ Limited:_____

Project Number:_MC46948_____
Date:_____07/19-20/2016_____
Shipping date:__07/20/2016_____
EPA Region:_____2_____

REVIEW OF EXTRACTABLE PETROLEUM HYDROCARBON (EPHs) PACKAGE

The following guidelines for evaluating volatile organics were created to delineate required validation actions. This document will assist the reviewer in using professional judgment to make more informed decision and in better serving the needs of the data users. The sample results were assessed according to the data validation guidance documents in the following order of precedence METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (EPH), Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

The hardcopied (laboratory name) _Accutest_Laboratories_____ data package received has been reviewed and the quality control and performance data summarized. The data review for SVOCs included:

Lab. Project/SDG No.: __MC46948_____ Sample matrix: _Groundwater_____
No. of Samples: _____3_____
Field blank No.: _____-_____
Equipment blank No.: _____-_____
Trip blank No.: _____-_____
Field duplicate No.: _____ MC46948-1/ MC46948-2_____

__X____ Data Completeness
__X____ Holding Times
__N/A__ GC/MS Tuning
__N/A__ Internal Standard Performance
__X____ Blanks
__X____ Surrogate Recoveries
__X____ Matrix Spike/Matrix Spike Duplicate
___X__ Laboratory Control Spikes
___X__ Field Duplicates
___X__ Calibrations
___X__ Compound Identifications
___X__ Compound Quantitation
___X__ Quantitation Limits

Overall Comments:
_Extractable_Petroleum_Hydrocarbons_by_GC_by_Method_MADEP_EPH,_REV_1.1._____
(C9_to_C36_Aliphatics;_C11_to_C22_(Aromatics)_____

Definition of Qualifiers:

J- Estimated results
U- Compound not detected
R- Rejected data
UJ- Estimated nondetect

Reviewer:_____
Date:_08/02/2016_____

DATA REVIEW WORKSHEETS

All criteria were met __x___
Criteria were not met and/or see below _____

I. DATA COMPLETNESS
A. Data Package:

MISSING INFORMATION	DATE LAB. CONTACTED	DATE RECEIVED

B. Other Discrepancies:

All criteria were met ___X___
Criteria were not met and/or see below _____

HOLDING TIMES
The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
Samples extracted and analyzed within method recommended holding time.				

Criteria

Preservation:

Aqueous samples must be acidified to a pH of 2.0 or less at the time of collection.
Soil samples must be cooled at 4 ± 2 °C immediately after collection.

Holding times:

Samples must be extracted within 14 days of collection, and analyzed within 40 days of extraction.

Cooler temperature (Criteria: 4 ± 2 °C):___5.3°C_____

Actions: Qualify positive results/nondetects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).
If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R).
If samples were not at the proper temperature (> 10°C) or improperly preserved, use professional judgment to qualify the results.

All criteria were met ___X___
Criteria were not met and/or see below _____

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration:_____06/22/16_____

Dates of initial calibration verification:_____06/22/13_____

Instrument ID numbers:_____GCDE_____

Matrix/Level:_____AQUEOUS/MEDIUM_____

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and initial calibration verification meet method specific requirements.				

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest. When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C9-C18 Aliphatic Hydrocarbons, C19-C36 Aliphatic Hydrocarbons, and C11-C22 Aromatic Hydrocarbons using the FID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.
    - The area for the surrogates must be subtracted from the area summation of the range in which they elute.
    - The areas associated with naphthalene and 2-methylnaphthalene in the aliphatic range standard must be subtracted from the uncorrected collective C9-C18 Aliphatic Hydrocarbon range area prior to calculating the CF.

DATA REVIEW WORKSHEETS

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples or every 24 hours (whichever is more frequent), and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than ±25%, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects.
If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration:_____06/22/16_____

Dates of continuing calibration verification:___07/25/16;_07/26/16_____

Dates of final calibration verification:_____07/25/16;_07/26/16_____

Instrument ID numbers:_____GCDE_____

Matrix/Level:_SOIL/AQUEOUS/MEDIUM_____

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initial and continuing calibration meet method specific requirements				

A separate worksheet should be filled for each initial curve

All criteria were met _____
Criteria were not met and/or see below ___X___

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
METHOD BLANKS MEET THE METHOD SPECIFIC CRITERIA EXCEPT IN THE CASES DESCRIBED IN THIS DOCUMENT.				
07/25/16	OP48223-MB	Aqueous/low	C11-C22 Aromatics (Unadj.)	44.7 ug/l
			C11-C22 Aromaticis	41.9 ug/l
			C9-C18 Aliphatics	21.6 ug/l
			Benzo(a)anthracene	0.47 ug/l
			2-Methylnaphthalene	0.52 ug/l
			Naphthalene	1.1 ug/l

Note: Analytes detected in method blank at a concentration below the reporting limits. Analytes detected in sample batch above MDL but below the reporting limits. Laboratory qualified the results as JB, no further qualification required.

Field/Trip/Equipment

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS
NO EQUIPMENT/FIELD/ ANALYZED ASSOCIATED WITH THIS DATA PACKAGE.				

Note:

All criteria were met _____
Criteria were not met and/or see below __X___

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.
If the concentration is ≥ SQL but < AL, report the compound as not detected (U) at the reported concentration.
If the concentration is > AL, report the concentration unqualified.

All criteria were met _____
Criteria were not met and/or see below __X___

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.
List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery.
Matrix: solid/aqueous

Samples and QC shown here apply to the above method

Lab Sample ID	Lab File ID	S1 a	S2 a	S3 b	S4 a
MC46948-1	DE14962.D	57	62	36* c	70
MC46948-1	DE14944.D	65	79	35* c	85
MC46948-2	DE14945.D	61	69	52	75
MC46948-3	DE14946.D	54	64	50	69
OP48223-BS	DE14941.D	72	69	53	71
OP48223-BSD	DE14942.D	71	71	54	70
OP48223-MB	DE14943.D	75	71	59	79

Surrogate Compounds	Recovery Limits
S1 = o-Terphenyl	40-140%
S2 = 2-Fluorobiphenyl	40-140%
S3 = 1-Chlorooctadecane	40-140%
S4 = 2-Bromonaphthalene	40-140%

(a) Recovery from GC signal #1 (b) Recovery from GC signal #2
(c) Outside control limits due to matrix interference. Confirmed by refractionation/ reanalysis.

Note: SURROGATE STANDARDS RECOVERIES WITHIN LABORATORY CONTROL LIMITS EXCEPT IN THE CASES DESCRIBED IN THIS DOCUMENT. NO ACTION TAKEN, PROFESSIONAL JUDGMENT.

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 40% or more than 140%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

(1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
(2) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

All criteria were met _____
Criteria were not met and/or see below __N/A___

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- **Matrix duplicate** - Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 40 - 140% of the true value. Lower recoveries of n-nonane are permissible but must be noted in the narrative if <30%.

MS/MSD Recoveries and Precision Criteria

Sample ID:_____-_____ Matrix/Level:_____-_____

List the %Rs, RPD of the compounds which do not meet the QC criteria.

MS OR MSD	COMPOUND	% R	RPD	QC LIMITS	ACTION

Note: No MS/MSD analyzed with this sample batch. Blank spike/Blank spike duplicate used to assess accuracy. BS/BSD % recoveries and RPD within laboratory control limits. No action taken.

All criteria were met _____
Criteria were not met and/or see below ___N/A_

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

2. MS/MSD – Unspiked Compounds

List the concentrations of the unspiked compounds and determine the % RSDs of these compounds in the unspiked sample, matrix spike, and matrix spike duplicate.

COMPOUND	CONCENTRATION SAMPLE	MS	MSD	%RPD	ACTION

Criteria: None specified, use %RSD $\leq$ 50 as professional judgment.

Actions:

If the % RSD > 50, qualify the results in the spiked sample as estimate (J).
If the % RSD is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

All criteria were met __X___
Criteria were not met and/or see below _____

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION

__LCS_RECOVERY_WITHIN_LABORATORY_CONTROL_LIMTS_____

Criteria:
* Refer to QAPP for specific criteria.
* The spike recovery must be between 40% and 140%. Lower recoveries of n-nonane are permissible. If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative. RPD between LCS/LCSD must be < 25%.

Actions:
Actions on LCS recovery should be based on both the number of compounds that are outside the %R and RPD criteria and the magnitude of the excedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.
If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.
If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? **Yes** or No.
If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

All criteria were met __X___
Criteria were not met and/or see below _____

IX. FIELD/LABORATORY DUPLICATE PRECISION

Sample IDs: ____MC46948-1/MC46948-2__ Matrix:____Groundwater___

Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
Field duplicate analyzed with this data package. RPD within laboratory and validation guidance document control limits (± 50 %) for analytes detected at a concentration ≥ SQL.					

Criteria:

The project QAPP should be reviewed for project-specific information.
RPD ± 30% for aqueous samples, RPD ± 50 % for solid samples if results are ≥ SQL.
If both samples and duplicate are <5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is ≥ 5x the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is < 5x the SQL, use professional judgment to determine if qualification is appropriate.

All criteria were met __X___
Criteria were not met and/or see below _____

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

1. Verify that the target analytes were within the retention time windows.

   - Retention time windows must be re-established for each Target EPH Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
   - The n-nonane (n-C9) peak must be adequately resolved from the solvent front of the chromatographic run.
   - All surrogates must be adequately resolved from the Aliphatic Hydrocarbon and Aromatic Hydrocarbon standards.
   - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
   - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

1a. Aliphatic hydrocarbons range:

   - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for n-C9 and 0.01 minutes before the Rt for n-C19.
   - Determine the total area count for all peaks eluting 0.01 minutes before the Rt for n-C19 and 0.1 minutes after the Rt for n-C36.

Are the aliphatic hydrocarbons range properly determined? **Yes?** or No?

Comments:

1b. Aromatic hydrocarbons range:

   - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for naphthalene and 0.1 minutes after the Rt for benzo(g,h,i)perylene.
   - Determine the peak area count for the sample surrogate (OTP) and fractionation surrogate(s). Subtract these values from the collective area count value.

Are the aliphatic hydrocarbons range properly determined? **Yes?** or No?

Comments:

All criteria were met __X___
Criteria were not met and/or see below _____

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.

3. Breakthrough determination - Each sample (field and QC sample) must be evaluated for potential breakthrough on a sample specific basis by evaluating the % recovery of the fractionation surrogate (2-bromonaphthalene) and on a batch basis by quantifying naphthalene and 2-methylnaphthalene in both the aliphatic and aromatic fractions of the LCS and LCSD. **If either the concentration of naphthalene or 2-methylnaphthalene in the aliphatic fraction exceeds 5% of the total concentration for naphthalene or 2-methylnaphthalene in the LCS or LCSD, fractionation must be repeated on all archived batch extracts.**

NOTE: **The total concentration of naphthalene or 2-methylnaphthalene in the LCS/LCSD pair includes the summation of the concentration detected in the aliphatic fraction and the concentration detected in the aromatic fraction.**

Comments:__Concentration_in_the_aliphatic_fraction_<_5%_of_the_total_____
_concentration_for_naphthalene_and_2-methylnaphthalene_____
_____
_____
_____

4. **Fractionation Check Standard** – A fractionation check solution is prepared containing 14 alkanes and 17 PAHs at a nominal concentration of 200 ng/µl of each constituent. The Fractionation Check Solution must be used to evaluate the fractionation efficiency of each new lot of silica gel/cartridges, and establish the optimum hexane volume required to efficiently elute aliphatic hydrocarbons while not allowing significant aromatic hydrocarbon breakthrough. For each analyte contained in the fractionation check solution, excluding n-nonane, the Percent Recovery must be between 40 and 140%. A 30% Recovery is acceptable for n-nonane.

Is a fractionation check standard analyzed? Yes? or No?

Comments: Not applicable.

All criteria were met __X___
Criteria were not met and/or see below _____

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

In order to demonstrate the absence of aliphatic mass discrimination, the response ratio of C28 to C20 must be at least 0.85. If <0.85, this nonconformance must be noted in the laboratory case narrative.

The chromatograms of Continuing Calibration Standards for aromatics must be reviewed to ensure that there are no obvious signs of mass discrimination.

Is aliphatic mass discrimination observed in the sample? Yes? or **No**?

Is aromatic mass discrimination observed in the sample? Yes? or **No**?

1. In the space below, please show a minimum of one sample calculation:

MC46948-1 EPH (C11 – C22, Aromatics) RF = 124800

[ ] = (2248458)/(124800)

[ ] = 18.02 ppb Ok

MC46948-1 EPH (C19 – C36, Aliphatics) RF = 77820

[ ] = (1265664)/(77820)

[ ] = 16.26 ppb Ok

2. If requested, verify that the results were above the laboratory method detection limit (MDLs).

3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

SAMPLE ID	DILUTION FACTOR	REASON FOR DILUTION

If dilution was not performed, estimate results (J) for the affected compounds. List the affected samples/compounds:

_____

_____